

TRANSIMS TRAVELOGUE

April 1999

TRANSIMS TRAVELOGUE describes current activities within the TRANSIMS project.

WHAT IS TRANSIMS?

The TRANsportation ANalysis and SIMulation System (TRANSIMS) is one part of the multi-track Travel Model Improvement Program sponsored by the U.S. Department of Transportation, the Environmental Protection Agency, and the Department of Energy. Los Alamos National Laboratory is leading this major effort to develop new, integrated transportation and air quality forecasting procedures necessary to satisfy the Intermodal Surface Transportation Efficiency Act and the Clean Air Act and its amendments.

TRANSIMS is a set of integrated analytical and simulation models and supporting databases. The TRANSIMS methods deal with individual behavioral units and proceed through several steps to estimate travel. TRANSIMS predicts trips for individual households, residents and vehicles rather than for zonal aggregations of households. TRANSIMS also predicts the movement of individual freight loads. A regional microsimulation executes the generated trips on the transportation network, modeling the individual vehicle interactions and predicting the transportation system performance. Motor vehicle emissions are estimated using traffic information produced by TRANSIMS.

TRANSIMS DEPLOYMENT STRATEGY

The goal of the TRANSIMS deployment strategy is to transition the TRANSIMS technology from Los Alamos research and development to commercial products used by transportation planning agencies such as metropolitan planning organizations. The strategic elements are defined customer needs, the TRANSIMS basic technology, the knowledge and know-how to apply the technology to the customer needs, the technical and financial constraints, and the product commercialization process.

Los Alamos National Laboratory is developing the TRANSIMS basic technology in the form of computer code called TRANSIMS-LANL. It

includes the TRANSIMS functional modules and the system framework.

The TRANSIMS-LANL technology has many uses, but the current program was specifically created to target the transportation planning applications. To focus the development on these applications, the Laboratory is preparing case studies based on the Portland OR transportation system. The case study preparation drives the underlying TRANSIMS-LANL research. Correspondingly, the TRANSIMS-LANL documentation also emphasizes the transportation planning application.

The Transportation Equity Act for the Twentieth Century (TEA-21) includes legislation to complete TRANSIMS-LANL, to develop a TRANSIMS commercial product, and to support early deployment of the TRANSIMS advanced transportation modeling computer software and graphics package to States, local governments, and metropolitan planning organizations with responsibility for travel modeling. The available federal funds together with cost sharing by commercial developers and the transportation planning organizations will contribute to the deployment process success. Computer hardware and software technology advances also promote the assimilation of the TRANSIMS technology by the transportation community.

The product commercialization process includes licenses and contracts with vendors/developers to build "product shells." The "product shells" take the TRANSIMS-LANL technology captured in its software and repackage it with enhancements to the user interface, the TRANSIMS modules, or other additions that make it more useable for specific markets. The first market we want to address is the transportation planning community as defined by the TEA-21 legislation.

In addition, sharing TRANSIMS with universities spreads the TRANSIMS methods and technology into university research, develops

competencies in the TRANSIMS sciences, and prepares tomorrow's transportation planners for exercising this capability to its fullest. Research licenses will be available for universities to use TRANSIMS-LANL for research, development, evaluation, and demonstration purposes.

OPPORTUNITY FORUM

A Workshop on TRANSIMS Commercialization and Deployment Opportunities will be held June 28-30, 1999 at the La Fonda Hotel in Santa Fe, New Mexico. It is intended for marketing managers and product developers from organizations interested in competing to develop TRANSIMS as a commercial package. They will be able to

- participate in the TRANSIMS commercialization process,
- receive a technical overview and further information about TRANSIMS,
- learn how the TRANSIMS software can be used in the transportation planning process,
- learn the requirements for the TRANSIMS commercial software,
- meet with the Los Alamos National Laboratory TRANSIMS development team,
- meet potential end users and learn and understand their transportation planning requirements,
- with prior agreement to restricted license, receive TRANSIMS software for evaluation in preparing a response to a Request for Qualifications to develop the TRANSIMS commercial software, and
- meet other software developers to form potential teaming relationships.

The TRANSIMS-LANL software and documentation will be given to all Workshop participants who sign a restricted license for evaluating the software as part of their response to the Request for Qualifications. The software and documentation will have to be returned to Los Alamos when the Request for Qualifications response is due.

Following the conference, interested organizations will have six weeks to respond to the Request for Qualifications. A second conference will be held during the fall of 1999 at a time and place to be determined in anticipation of a Request for Proposals.

We invite conference attendees from software product development organizations with

business interests in commercializing computationally intensive software products that support simulation and analyses of transportation and other large socioeconomic systems.

There is a \$200 registration fee for the Conference on the Commercialization of TRANSIMS to cover the costs of continental breakfasts, lunches, and refreshments.

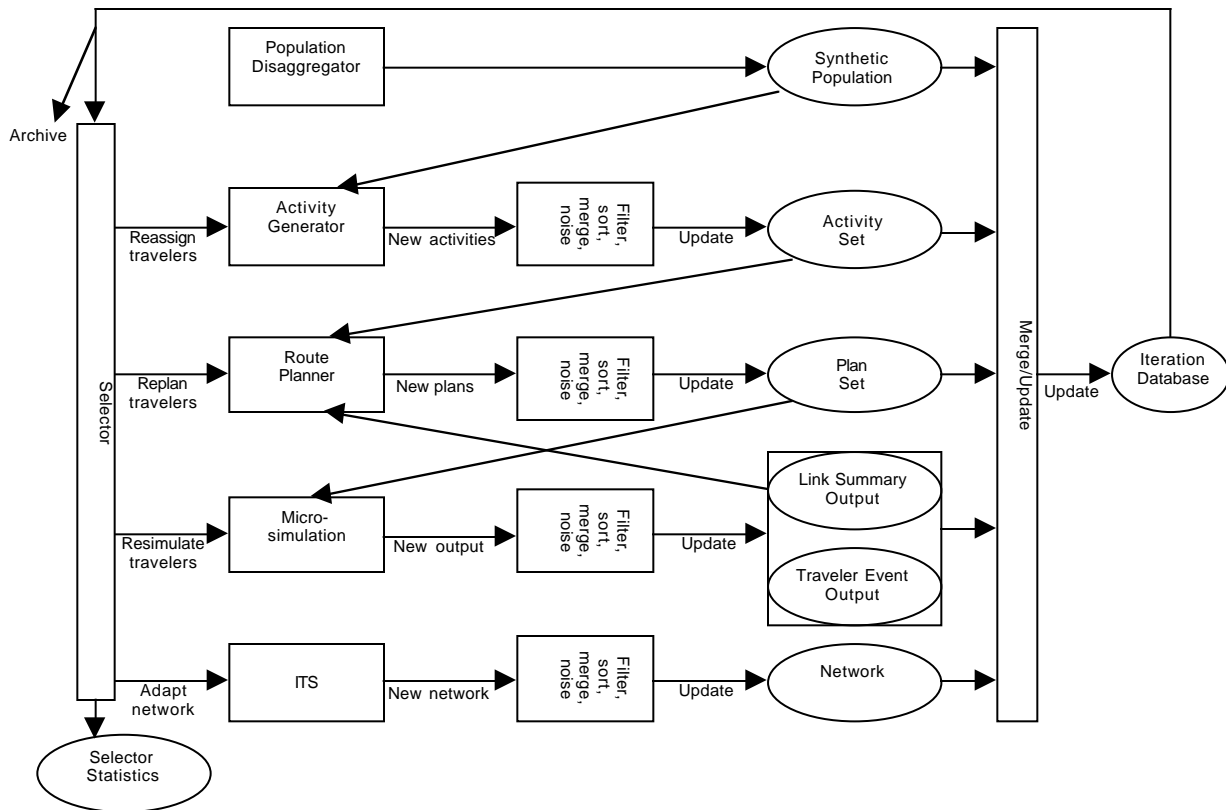
For further information and pre-registration materials regarding this conference, please contact Angelica Cisneros, Los Alamos National Laboratory, (505) 667-4689, FAX (505) 667-7530, angelica@lanl.gov.

TRANSIMS-LANL

TRANSIMS-LANL is the version of TRANSIMS that will be distributed under special license at the June 28-30 conference in Santa Fe. TRANSIMS-LANL will demonstrate all the TRANSIMS components. It includes the functional modules and the system framework. The "system framework" is the software, protocols, conventions, and data structures that support feed forward and feedback of information among the functional modules. The framework includes a "selector" module that specifies data to be distributed among the modules, transformations such as the addition of noise to the data values, and the sequences that comprise the feed forward and feed back paths.

TRANSIMS-LANL also will contain several networks. Some networks will demonstrate only the microsimulation. Others will require simplified synthetic population and activity generators, while others will be based on the full Los Alamos National Laboratory synthetic population generator and the activity generator developed by the National Institute of Statistical Sciences for the TRANSIMS project. Each TRANSIMS-LANL component will be documented. The components to be included in TRANSIMS-LANL are:

1. TRANSIMS framework
2. Population synthesizer
3. Activity generators
4. Route planner
5. Microsimulation
6. Emission models
7. Viewers
8. Calibration networks and files



Information Flow in the TRANSIMS Framework

SELECTORS

A *Selector* is a TRANSIMS framework component that controls the iteration process. Typically a TRANSIMS study involves iteration to move information between components such as the Activity Generator, Route Planner, and Travel Microsimulation. For example, iteration moves information about actual travel times from the Travel Microsimulation to the Route Planner. Iteration also is necessary to reach quasi-equilibrium among the nonlinear processes simulated by the TRANSIMS modules.

Different study designs involve different iteration schemes; hence different Selectors may be used in different studies. There is no single, "standard" Selector component. The figure illustrates where Selectors reside within the TRANSIMS framework.

At the beginning of each iteration, the iteration script controlling the current study typically invokes a Selector. (The script might use a different Selector for each iteration in a study.) When a Selector runs, it usually will:

- Read information about the travelers from the *Iteration Database*.
- Examine each traveler and decide whether to
 - regenerate activities using the Activity Generator,
 - choose a new route between existing activities using the Route Planner, or
 - retain existing activities and the planned route between them.
- Write the selections made for each traveler into data files that can be read by the Activity Generator or Route Planner when they are executed.
- Summarize the selections made and the current state of the system into a *Selector Statistics* data file.

After the Selector completes the selection process for all travelers, the Activity Generator, Route Planner, or Travel Microsimulation calculates the updated activity set, plan set, or microsimulation output files, respectively, according to the Selector decisions. At the start of the next iteration the iteration script again will invoke a Selector.

The major input to the Selector is the *Iteration Database*. The Iteration Database contains a summary history of each traveler's attributes, expectations, and experiences during the iterations within a study. The Selector uses these data items to make its selection decisions. *Attributes* represent quasi-static information about travelers such as their age, income, gender, or profession. *Expectations* encompass information such as how long a traveler expects to travel between two activities based on the route between them generated by the Route Planner. *Experiences* comprise information extracted from detailed Travel Microsimulation output—for instance, the actual travel time realized in the microsimulation between two activities. The analyst may choose which attribute, expectation, and experience data resides in the Iteration Database to be readily available to the Selector for a particular study. Additional data from activity sets, plan sets, and microsimulation output also might be used by some Selector implementations.

The Selector has two principal outputs, *Selector Statistics* and *Selection Choices*. The Selection Choices files simply list the travelers that will be reassigned activities, replanned, resimulated, etc.; these files record the detailed Selector decisions. The Selector Statistics provide a basic summary of the choices a Selector makes, e.g., how many travelers are being replanned and distributions of the difference between expected travel times and experienced travel times for various traveler populations.

The TRANSIMS framework allows for countless variations on the selection process. For example, in some studies part of a Selector may run again *after* the Activity Generator or Route Planner completes its execution. Then the Selector decides which activities or plans just generated will be accepted. Those not accepted are discarded and the previous activities or plans for travelers are retained. One also can

design Selectors that will feed travelers to the Activity Generator or Route Planner one-by-one so that the Selector, Activity Generator, Route Planner, and Traffic Microsimulation all execute simultaneously with their coordination controlled by the Selector—this may increase the computational efficiency of a study and allow for new experimental designs with finely controlled iteration. A Selector might make additional choices such as

- which version of the Activity Generation, Route Planner, or Traffic Microsimulation will run during the present iteration,
- whether transit schedules will be adjusted or vehicles added or removed from the transit fleet,
- whether network characteristics such as traffic signal timing, congestion pricing, or roadway information signs will be altered,
- which travelers will receive data from traffic information systems, or
- whether to complete the study (i.e., end the iteration) because the iterations have converged sufficiently (or diverged).

The TRANSIMS-LANL software package contains several Selector implementations for use in typical transportation planning studies. It is not difficult for analysts to write additional Selectors for their own specialized studies.

FURTHER INFORMATION

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